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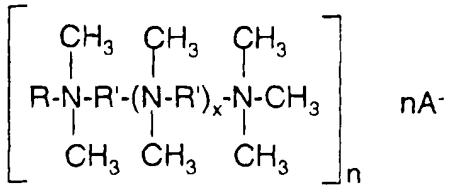
(54) Polyquaternary ammonium anionic scavengers for rinse cycle fabric softeners

(57) A rinse cycle fabric softener concentrate consisting essentially of a blend of 1-50 weight % of at least one monoalkyl polyquat having the formula:



wherein R is a C_{10-24} alkyl, an ether having the formula ROR_1- where R is as defined above and R_1 is equal to a C_{1-6} hydrocarbyl group, or an amido having the formula $RC(O)NR_2$-, where R is as defined above and R_2 is a C_{2-6} alkyl, R' is a C_{2-12} alkyl, x is 0-5; n is the number of moles of monovalent anion A to provide a net zero charge; and A is a monovalent anion, and 50-99 weight % of a cationic fabric softener agent, said agent being selected from the group consisting of ester-containing quaternary ammonium compounds, amido amine quaternary ammonium compounds, imidazoline

EP 1 149 890 A2

quats and mixtures and salts thereof.

Description

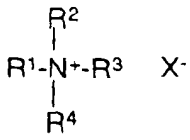
[0001] The present invention relates to fabric softeners, and more particularly to fabric softener concentrates that are added during the rinse cycle of a laundering process. Specifically, the present invention relates to a rinse cycle fabric softener concentrate that includes at least one polyquaternary (polyquat) ammonium anionic scavenger and at least one cationic quaternary ammonium fabric softener agent. The rinse cycle fabric softener concentrate of the present invention containing the polyquaternary ammonium anionic scavenger exhibits improved performance, i.e., softening, dye transfer inhibition and water dispersibility, as compared to prior art fabric softeners that do not contain the anionic scavenger described herein.

[0002] In the field of laundering, it is well known to add a liquid fabric softener containing at least one softening agent such as a cationic quaternary ammonium compound or salt thereof directly into the laundering process. The addition of the liquid fabric softener typically occurs during the rinse cycle itself. Although some improved softness may arise from the use of prior art fabric softeners, the overall softening performance of prior art fabric softeners is hindered due to high levels of residual anionics which are typically present in the washing liquor; the high level of residual anionics in the laundry liquor is the result of utilizing detergents that contain a high concentration of anionic surfactants which are not typically removed prior to the rinsing cycle. This is particularly the case in North America wherein high levels of anionic surfactants are employed in the detergent, and little or no rinsing occurs prior to the addition of the fabric softener.

[0003] The hindered softening performance of prior art fabric softeners can be attributed to the high affinity that the cationic softening agents have for negatively charged species and/or surfaces. When high levels of anionics are present in the laundering liquor, the anionics compete with the negatively charged surfaces of the laundered fabric for the cationic fabric softener agent and complexation of the anionics and the cationic fabric softener agent occurs. Complexation of the anionics with the cationic fabric softener agent is undesirable since it significantly reduces the overall amount of fabric softener agent present in the rinse cycle which is needed to obtain a high degree of softening. Thus, because of the reduced levels of fabric softener agents in the laundry liquor, prior art fabric softeners can not achieve a high degree of softness.

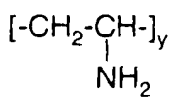
[0004] Attempts have been made in the prior art to increase the amount of cationically charged species present in the laundry liquor. For example, it is known to add so-called "charge boosters" to fabric softeners in order to increase the amount of positively charged species present in the laundry liquor during the rinse cycle. Illustrative examples of some prior art charge boosters which are disclosed in WO 94/20597, U.S. Patent Nos. 5,759,990 and 5,474,690, for example, include, but are not limited to:

(i) Quaternary ammonium compounds having the formula:



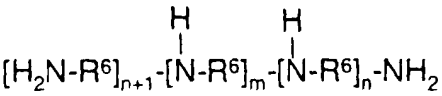
wherein R^1à, R^2à, R^3à and R^4à are independently C_{1-22} alkyl, C_{3-22} alkenyl, R^5à-$Q(CH_2)_m$-, where R^5à is a C_{1-22} alkyl, and mixtures thereof; Q is a carbonyl unit; m is from 1 to 6, and X is an anion;

(ii) Polyvinyl amines having the formula



wherein y is from 3 to about 5000. Optionally, one or more of the polyvinyl amine backbone -NH_2- unit hydrogens can be substituted with an alkyleneoxy moiety;

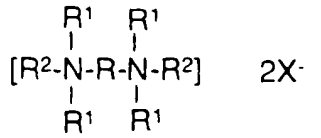
(iii) Polyalkylenimines having the formula



wherein each R^6à is independently a C_{2-4} alkylene, C_{3-4} substituted alkylene and mixtures thereof; the value of m

is from 2-700 and the value of n is from 0 to 350. Optionally, one or more of the polyvinyl amine backbone $-NH_2-$ unit hydrogen can be substituted with an alkyleneoxy moiety.

(iv) Poly-quaternary ammonium compounds having the formula



wherein R is substituted or unsubstituted C_{2-12} alkylene, substituted or unsubstituted C_{2-12} hydroalkylene, each R^1 is independently C_{1-4} alkyl, each R^2 is independently C_{1-22} alkyl, C_{3-22} alkenyl, R^5-Q-$(CH_2)_m$-, where R^5 is C_{1-22} alkyl, C_{3-22} alkenyl, and mixtures thereof; m is from 1 to 6; Q is a carbonyl unit; and X is an anion; and

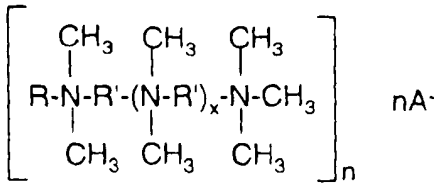
(v) Cationic polymers such as amine salts or quaternary ammonium salts.

[0005] Although prior art charge boosters are known, there is still a need for developing new and improved charge booster (hereinafter referred to as "anionic scavengers") that serve to increase the level of cationic active agent present in the rinse cycle of a laundering process. Moreover, prior art fabric softener formulations that include the above mentioned charge boosters require a separate polymeric dye transfer inhibition agent which prevents dye transfer during laundering. The addition of a separate dye transfer agent increases the number of processing steps in formulating the fabric softener. The additional processing steps result in an increased cost in producing the fabric softener which is past along to the consumer.

[0006] In view of the above mentioned drawbacks with prior art rinse cycle fabric softeners, it would be extremely beneficial if a new and improved rinse cycle fabric softener concentrate was developed that was capable of providing improved softness as well as inhibiting dye transfer without the need of adding separate ingredients to accomplish the aforementioned properties.

[0007] The present invention provides a rinse cycle fabric softener concentrate that has improved fabric softening capabilities, while being capable of inhibiting dye transfer without the need of utilizing separate ingredients which carry out the aforesaid functions. Specifically, the rinse cycle fabric softener concentrate of the present invention is a blend of quaternary ammonium compounds that consists essentially of:

(i) 1-50 weight % of at least one polyquat having the formula:



wherein R is a C_{10-24} alkyl, an ether having the formula ROR_1- where R is as defined above and R_1 is equal to a C_{1-6} hydrocarbyl group, or an amido having the formula $RC(O)NR_2$-, where R is as defined above and R_2 is a C_{2-6} alkyl; R' is a C_{2-12} alkyl; x is 0-5; n is the number of moles of monovalent anion A to provide a net zero charge; and A is a monovalent anion; and

(ii) 50-99 weight % of a cationic fabric softener agent, said agent being selected from the group consisting of ester-containing quaternary ammonium compounds (i.e., ester quats), amido amine quaternary ammonium compounds, imidazoline quats and mixtures and salts thereof.

[0008] The rinse cycle fabric softener concentrate of the present invention may be used with conventional liquid carriers such as water, C_{1-4} monohydric alcohols, C_{2-10} polyhydric glycols, diols or triols, polyalkenylene glycols, and mixtures thereof to form a liquid rinse cycle fabric softener formulation. In this embodiment of the present invention, the concentration of the inventive rinse cycle fabric softener concentrate in the liquid fabric softener formulation is from about 2 to about 40 weight %.

[0009] In a further embodiment of the present invention, a clear concentrate or formulation containing up to 60 weight % active ingredient is also contemplated.

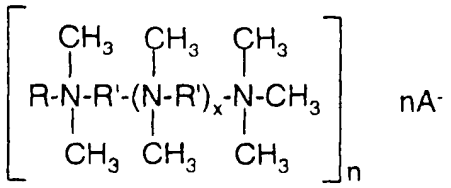
[0010] The rinse cycle fabric softener concentrate or liquid fabric softener formulation of the present invention is used in the rinse cycle of any laundering process wherein conventional detergents are employed. In one embodiment of the present invention, the inventive concentrate or formulation is used in a laundering liquor wherein the detergent contains a high level of anionic surfactants present therein. The term "high level of anionics" refers to a detergent composition that contains at least 10% or more of an anionic surfactant present therein. The rinse cycle fabric softener formulation of the present invention is used in an amount of from about 0.05 to about 0.4 weight % of said fabric softener formulation, per 100 grams of fabric to be laundered.

[0011] The improved softness that is obtainable using the rinse cycle fabric softener concentrate or formulation of the present invention is attributed to the above-defined polyquat component. Specifically, the polyquat component of the present invention serves as an efficient anionic scavenger which inhibits complexation of the anionics with the softening agents.

[0012] In addition to improved softness, the inventive rinse cycle fabric softener concentrate or formulation is also effective in preventing dye transfer. Moreover, the presence of the polyquat component in the fabric softener unexpectedly increases the water dispersibility of the active agents present in the fabric softener. The increased water dispersibility results in a higher solids rinse cycle fabric softener formulation that contains up to 25% of softening actives present therein. More preferably, the rinse cycle fabric softener formulation of the present invention contains from about 2 to about 40% of softening actives present therein.

[0013] As stated above, the present invention is directed to a rinse cycle fabric softener concentrate and formulation which include a blend of quaternary ammonium compounds that consists essentially of at least one polyquat component and at least one conventional quaternary ammonium fabric softener agent. The fabric softener concentrate of the present invention contains from about 1 to about 50 weight % of the at least one polyquat component and from about 50 to about 99 weight % of the at least one conventional quaternary ammonium fabric softener agent. In a preferred embodiment of the present invention, the fabric softener concentrate of the present invention contains from about 2 to about 20 weight % of the at least one polyquat component and from about 80 to about 98 weight % of the at least one conventional quaternary ammonium fabric softener agent. In a more highly preferred embodiment of the present invention, the fabric softener concentrate of the present invention contains from about 5 to about 15 weight % of the at least one polyquat component and from about 85 to about 95 weight % of the at least one conventional quaternary ammonium fabric softener agent.

[0014] The polyquat component of the fabric softener concentrate of the present invention has the following formula:



wherein R is a C_{10-24}, preferably C_{16-18}, saturated or unsaturated alkyl, an ether having the formula ROR_1- where R is as defined above and R_1 is a C_{1-6} hydrocarbyl group, preferably R_1 is a C_{2-4} alkyl, or an amido having the formula $RC(O)NR_2$-, where R is as defined above and R_2 is a C_{2-6}, preferably a C_{2-3}, alkyl; R' is a C_{2-12}, preferably C_{2-3}, alkyl; x is 0-5, preferably 0 to 1; n is the number of moles of monovalent anion A to provide a net zero charge, preferably n is from 2 to 3; and A is a monovalent anion including, but not limited to: chloride, bromide, methyl sulfate, ethyl sulfate, formate, acetate, carbonate, sulfate, nitrate and other like anions, preferably A is chloride or methylsulfate.

[0015] Illustrative examples of suitable polyquats having R equal to a C_{10-24} alkyl include, but are not limited to: tallow diquat and tallow triquat. Of these alkyl-containing polyquats, tallow diquat is most highly preferred.

[0016] Preferred examples of polyquats having R equal to an ether (ROR_1-) include, but are not limited to: C_{12-18} ether propyl diquats. Of these ether-containing polyquats, C_{14-15} ether propyl diquats are highly preferred.

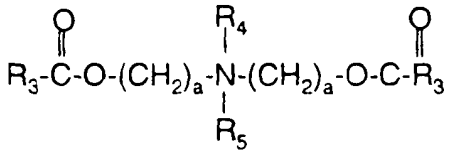
[0017] Illustrative examples of polyquats having R equal to amido ($RC(O)NR_2$-) include, but are not limited to: tallow amidopropyl diquat and stearyl amidopropyl diquat. Of these amido-containing polyquats, stearyl amidopropyl diquat is preferred.

[0018] Of the various polyquats mentioned above, tallow diquat is most highly preferred. When tallow diquat is employed, the diquat is typically used in an amount of from about 5 to about 15 weight % in the rinse cycle fabric softener concentrate.

[0019] As stated above, the polyquat component of the concentrate of the present invention serves as an anionic scavenger complexing with any anionic detergent species present in the laundering liquor. The polyquats of the present invention have a higher charge density as compared to the other quaternary ammonium compounds present in the blend, therefore, the polyquat component has a higher affinity for complexing with the anionics present in the laundering liquor than the other quaternary ammonium compounds present in the rinse cycle fabric softener concentrate. The polyquats of the present invention are made utilizing conventional techniques that are well known in the art. For example, the polyquat can be prepared by reacting a tallow diamine with 5 moles NaCl and 3 moles NaOH.

[0020] The other quaternary ammonium compound of the inventive fabric softener concentrate is a conventional cationic fabric softener agent that is selected from the group consisting of ester-containing quaternary ammonium compounds (i.e., ester quats), amido amine quaternary ammonium compounds, imidazoline quats, and mixtures and salts thereof. These quaternary ammonium compounds are well known in the art and are made utilizing conventional processing techniques that are also well known in the art.

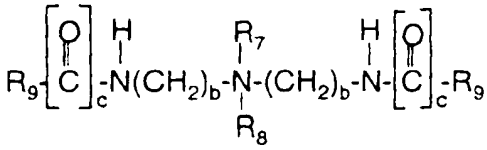
[0021] The terms "ester-containing quaternary ammonium" or "ester quats" are used herein to denote a quaternary ammonium compound having the following formula:



wherein each R_3 is the same or different and is a saturated or unsaturated C_{9-23}, preferably C_{15-17}, alkyl; R_4 and R_5 are the same or different and are hydrogen, C_{1-6} hydrocarbyl group or hydroxy alkyl, and a is from 1 to 6, preferably 2 to 3. The term "hydrocarbyl" is used herein to denote aliphatic (i.e., a linear or branched, saturated or unsaturated hydrocarbon group, that is, alkyl, alkenyl and alkynyl groups), cycloaliphatic, aryl, alkaryl and aralkyl groups. Salts of the above illustrated ester quats are also contemplated herein. When the ester quat is in salt form, one of the above mentioned anions, A, is associated with the structure shown above.

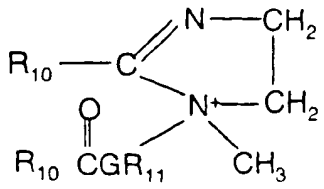
[0022] Examples of ester-containing quats that can be employed in the present invention include, but are not limited to: triethanol amine (TEA) ester quat and methyl diethanol amine (MDEA) ester quat.

[0023] The term "amido amine quaternary ammonium compound" is used herein to denote a quaternary ammonium compound having the following formula:



wherein R_7 is hydrogen or a C_{1-4} alkyl, R_8 is a C_{1-4} alkyl, ethoxy or propoxy, each R_9 is the same or different and is a saturated or unsaturated C_{7-21} alkyl or alkenyl group, c is 0 or 1 and b is 1 to 6. Salts of the amido amines having the above formula are also contemplated herein. Examples of amido amine quats that can be employed in the present invention include, but are not limited to: oleyl based amido amine dimetyl sulfate based quat (VARISOFT® 222LT-90).

[0024] The term "imidazoline quat" is used herein to denote a quaternary ammonium compound having one of the following formulas:



wherein R_{10} is an acyclic alkyl or alkylene C_{11-21} hydrocarbon group; R_{11} is a divalent C_{1-6} alkyl group; and G is O or NH. Salts of the above imidazoline compounds are also contemplated herein. Examples of imidazoline quats that can be employed in the present invention include, but are not limited to: VARISOFT® 475.

[0025] Of the various cationic quaternary ammonium fabric softeners mentioned above, it is preferred to utilize triethanol amine (TEA) ester quat as the cationic fabric softener agent. When TEA ester quat is employed, the ester quat is used in an amount of from about 85 to about 95 weight % in the rinse cycle fabric softener concentrate.

[0026] The rinse cycle fabric softener concentrate of the present invention is a blend of the above mentioned quaternary ammonium compounds that is made utilizing conventional processes that are well known to those skilled in the art for making fabric softeners. For example, the rinse cycle fabric softener concentrate of the present invention can be made by separately adding each ingredient to a reaction vessel. Mixing by hand, or with a mechanical mixer is typically carried out to ensure that a substantially homogeneous mixture of the components is obtained. The blend may be made at room temperature or, if desired, elevated temperatures can be employed. The ingredients of the blend may be added in a one shot process, or alternatively the ingredients may be added dropwise or in small incremental amounts.

[0027] Alternatively, the rinse cycle fabric softener concentrate of the present invention may be made by melting and mixing the individual components together utilizing melt mixing techniques that are well known to those skilled in the art.

[0028] The rinse cycle fabric softener concentrate of the present invention may be made into a liquid fabric softener formulation by introducing the same into a liquid carry under high shear mixing conditions. The mixing may be conducted at room temperature, or alternatively, temperatures of from 40°C to 90°C can be employed.

[0029] Suitable liquid carries that may be employed in the present invention include, but are not limited to: water; C_{1-4} monohydric alcohols; C_{2-10} polyhydric glycols, diols, or triols; polyalkenylene glycols; and mixtures and combinations thereof.

[0030] In embodiments wherein the inventive rinse cycle fabric softener concentrate is used with a liquid carrier, the inventive rinse cycle fabric softener concentrate is present in a concentration of from about 2 to about 40 weight %.

[0031] In addition to liquid carries, the inventive rinse cycle fabric softener concentrate may be used with other conventional materials that are typically present in liquid rinse cycle fabric softeners. For example, brighteners, soil removers, solvotropes, perfumes, dyes, bactericides, chelating agents, silicones, and the like may be present in the liquid fabric softener formulation of the present invention. The only limitation on the liquid fabric softener of the present invention is that it contains at least the inventive rinse cycle fabric softener concentrate therein. Since the rinse cycle fabric softener concentrate of the present invention is capable of efficiently inhibiting dye transfer, there is no need to add a separate dye transfer inhibition agent into the inventive liquid rinse cycle fabric softener formulation.

[0032] The rinse cycle fabric softener concentrate or formulation of the present invention can be added during the rinse cycle of a laundering process wherein any detergent is present in the laundry liquor. That is, the inventive rinse cycle fabric softener concentrate or formulation can be added to a laundering liquor that contains anionic surfactants, non-ionic surfactants, amphoteric surfactants, zwitterionic surfactants or any combinations or mixtures thereof.

[0033] In a preferred embodiment of the present invention, the inventive rinse cycle fabric softener concentrate or formulation may be used with any conventional detergent that includes a high level of anionic surfactants present therein. That is, the rinse cycle fabric softener concentrate or formulation of the present invention is used with a detergent that contains from about 10 to about 80 weight % of at least one anionic surfactant present therein. More preferably, the detergent contains from about 30 to about 70 weight % of at least one anionic surfactant present therein.

[0034] Suitable anionic surfactants that can be employed in the detergent composition include water soluble salts, preferably the alkali metal, ammonium and alkylammonium salts of organic sulfuric acid reaction products having in their molecular structure an alkyl group containing from about 10 to about 20 carbon atoms and a sulfonic acid or sulfuric acid ester group. (Included in the term "alkyl" is the alkyl portions of acyl groups).

[0035] Some illustrative examples of the above type of anionic surfactants are the sodium and potassium alkyl sulfates, especially those obtained by sulfating higher C_{8-18} alcohols, such as those produced by reducing the glycerides of tallow or coconut oil; and the sodium and potassium alkylbenzene sulfonates in which the alkyl group is straight chained or branched, and the alkyl contains from about 9 to about 15 carbon atoms. The alkylbenzene sulfonates of the former type are described, for example, in U.S. Patent Nos. 2,220,099 and 2,477,383.

[0036] Especially preferred alkylbenzene sulfonates are linear straight chain alkylbenzene sulfonates in which the average number of carbon atoms in the alkyl group is from about 10 to 15, abbreviated as C_{10-15} LAS. The alkali salts, particularly the sodium salts of these anionic surfactants are preferred. Alkylbenzene sulfonates and processes for producing the same are disclosed, for example, in U.S. Patent No. 2,220,099 and 2,477,383.

[0037] Other anionic surfactants that can be employed in the detergent composition include alkyl alkoxylated sulfates. These compounds are water-soluble salts or acids having the formula $RO(A)_mSO_3M$ wherein R is an unsubstituted C_{10-24} alkyl or hydroxyalkyl group having a C_{10-18} alkyl or hydroxyalkyl group, A is an ethoxy or propoxy unit, m is greater than zero, preferably m is between about 0.5 and about 6, and M is hydrogen or a water soluble cation which can be, for example, a metal cation (e.g., sodium, potassium, lithium, calcium, magnesium, etc.), ammonium or substituted-ammonium cation. Specific examples of substituted ammonium cations include, but are not limited to: methyl-, ethyl-, dimethyl-, trimethyl-ammonium and quaternary ammonium cations, such as tetramethyl-ammonium, dimethyl piperdinum and cations derived from alkanolamines such as monoethanolamine, diethanolamine and triethlamine, and mixtures thereof.

[0038] Illustrative examples of the foregoing alkyl alkoxylated sulfates include: C_{12-18} alkyl polyethoxylate (1.0) sulfate, C_{12-18} alkyl polyethoxylate (2.25) sulfate, C_{12-18} alkyl polyethoxylate (3.0) sulfate, C_{12-18} alkyl polyethoxylate (4.0) sulfate, wherein M is sodium or potassium.

[0039] Other anionic surfactants useful in the detergent composition include sodium alkyl glyceryl ether sulfonates, particularly those ethers of higher alcohols derived from tallow and coconut oil; sodium coconut oil fatty acid monoglyceride sulfonates and sulfates.

[0040] Still further anionic surfactants include water-soluble salts of esters of alpha-sulfonated fatty acids containing from about 6 to about 20 carbon atoms in the fatty acid portion of the compound and from 1 to about 10 carbon atoms in the ester group; water-soluble salts of 2-acyloxyalkane-1-sulfonic acids containing from about 2 to about 9 carbon atoms in the acyl portion of the compound and from about 9 to about 23 carbon atoms in the alkane moiety; water-soluble salts of olefin and paraffin sulfonates containing from about 12 to about 20 carbon atoms; and beta-alkyloxy alkane sulfonates containing from 1 to about 3 carbon atoms in the alkyl group and from about 8 to

about 20 carbon atoms in the alkane moiety

[0041] In addition to anionic surfactants, the detergent may optionally include one or more nonionic surfactants therein. Typical nonionic surfactants that can be present in the detergent composition include polyethylene, polypropylene and polybutylene oxide condensates of alkyl phenols. Other examples of nonionic surfactants include condensation products of primary and secondary aliphatic alcohols, alkylpolysaccharides, condensation products of ethylene oxide with a hydrophobic base formed by the condensation of propylene oxide with propylene glycol, condensation products of ethylene oxide with the product resulting from the reaction of propylene oxide and ethylenediamine, and polyhydroxy fatty acid amides.

[0042] The detergent may also include any conventional amphoteric or zwitterionic surfactant therein. It is noted the use of the inventive rinse cycle fabric softener formulation is not limited to a specific type of detergent, but rather the rinse cycle fabric softener formulation of the present invention can be used with any conventional detergent.

[0043] In addition to the above ingredients, the detergent composition may also include conventional detergent builders, enzymes, bleaching agents, bleach activators, polymeric soil release agents, chelating agents, soil release and anti-redeposition agents, dispersing agents, optical brighteners, whitening agents, betaines, sultanies and other like components that may be typically used in laundry detergents. Since all these compounds are conventional, a detailed description of the optional components is not provided herein. A detailed description of these detergent components however can be found in WO 98/53034, the contents of which is incorporated herein by reference.

Operational Use:

[0044] The rinse cycle fabric softener concentration or formulation of the present invention is typically added to the rinse cycle of a laundry process utilizing conventional washing temperatures of about 20°C to about 60°C and rinsing temperatures of about 10°C to about 50°C. The rinse cycle fabric softener concentrate or formulation of the present invention is effective over a wide range of water hardness levels.

[0045] The rinse cycle fabric softener concentrate or formulation of the present invention may be used in laundering operations by adding the formulation to a laundering vessel in amounts that are typically used. Specifically, the inventive rinse cycle formulation of the present invention is used in an amount of from about 20 g to about 120 g solids content of fabric softener with a 3 to 8 pound load of clothing to be washed. The particular amount of fabric softener used in the rinsing cycle is not however critical to the present invention.

[0046] The following examples are given to illustrate the present invention and to demonstrate some advantages that can be obtained from utilizing the same.

[0047] In the examples, dye transfer inhibition was determined by measuring the average delta E utilizing ASTM Test No. D-5548-94, "Evaluating Color Transfer or Color Loss of Dyed Fabric in Home Laundry", the content of which is incorporated herein by reference. Specifically, swatches of nylon fabric dyed with Acid Red 151, and cotton fabric dyed with either Direct Blue 90 or Direct Blue 1, were washed under standardized, identical conditions (90 rpm, 40 minutes, about 50°C, water hardness about 110 rpm) together with a swatch of undyed (white) cotton fabric (swatches dyed with different dyes were not washed together). The washed, dyed and undyed, swatches were recovered, rinsed in 20°C rinse water and air dried.

[0048] The surface reflectance, the redness/greenness, and the yellowness/blueness, of the white swatches were measured by a colorimeter both before and after washing, under conditions identical for each swatch. The total color difference ("delta E") is calculated from the following equation:

$$\text{delta } E = ((L_w - L_o)^2 + (a_w - a_o)^2 + (b_w - b_o)^2)^{1/2}$$

wherein L = reflectance; a = redness/greenness; b = yellowness/blueness; w = fabric before washing; and o = fabric after washing.

[0049] A lower delta E value represents less dye transfer and thus a better performing product.

[0050] Softness was tested by utilizing standard North American washing conditions. Specifically, a Kenmore washing machine and a Kenmore electrical dryer were used. Washing was carried out as follows:

Warm Wash (30°C)

Cold Rinse (11°C)

45 grams of a commercially available anionic-containing detergent

1700 grams of fabric (Cotton terry towels and Sheets)

[0051] Softener Dosage = 0.25 % based on softener actives per weight of fabric

[0052] Softness was ranked from softest to hardest using a panel containing 8 members. In the examples, a ranking of 2 represents the best result

EXAMPLE 1

[0053] In this example, the dye transfer inhibition of two fabric softener concentrates of the present invention were determined and compared to prior art fabric softeners. A control containing no fabric softener was also used. The dosage of fabric softener used in each experiment was 0.45 gm/l H_2O.

SAMPLE	Delta E
Control (No fabric softener)	28.7
Standard tallow based TEA ester quat (Prior Art)	6.5
National Brand 1 (Prior Art)	5.0
National Brand 2 (Prior Art)	5.5
95% Tallow based TEA ester quat + 5% Tallow based diammonium dichloride (INVENTION)	4.9
90% Tallow based TEA ester quat + 10% Tallow based diammonium dichloride quat (INVENTION)	3.2

[0054] The results in the above table demonstrate that the inventive concentrates provide improved dye transfer as compared to a standard tallow based TEA ester quat and two national brands.

EXAMPLE 2

[0055] In this example, a concentrate of the present invention was prepared and its softening property was compared to a conventional TEA ester quat.

SAMPLE	RANK
Standard Tallow based TEA ester quat (Prior Art)	1
95% Tallow based TEA ester quat + 5% Tallow based diammonium dichloride (INVENTION)	2

[0056] The result of the softness test illustrates that the inventive concentrate has improved softness compared to a standard tallow based TEA ester quat.

EXAMPLE 3

[0057] In this example, a concentrate of the present invention was prepared and its softening property was compared to a conventional oleyl based amido amine dimetyl sulfate based quat (VARISOFT® 222LT-90).

SAMPLE	RANK
VARISOFT® 222LT-90 (Prior Art)	1.1
95% VARISOFT® 222LT-90 + 5% Tallow baseddiammonium dichloride (INVENTION)	1.9

[0058] The result of the softness test illustrates that the inventive concentrate has improved softness compared to a standard amido amine quat.

EXAMPLE 4

[0059] In this example, a concentrate of the present invention was prepared and its softening property was compared to a conventional imidazolinium quat (VARISOFT® 475).

SAMPLE	RANK
VARISOFT® 475 (Prior Art)	1.1
95% VARISOFT® 475 + 5% Tallow based diammonium dichloride (INVENTION)	1.9

[0060] The result of the softness test illustrates that the inventive formulation has improved softness compared

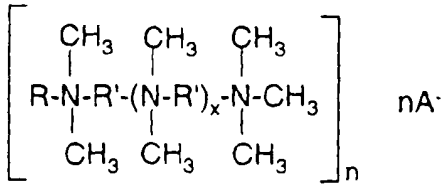
to a standard imidazolinium quat.

[0061] While the present invention has been particularly shown and described with respect to preferred embodiments thereof, it will be understood by those skilled in the art that the foregoing and other changes in form and detail may be made without departing from the spirit and scope of the present invention. It is therefore intended that the present invention not be limited to the exact forms described and illustrated, but fall within the scope of the appended claims.

Claims

1. A rinse cycle fabric softener concentrate consisting essentially of a blend of:

(i) 1-50 weight % of at least one polyquat having the formula:



wherein R is a C_{10-24} alkyl, an ether having the formula ROR_1- where R is as defined above and R_1 is a C_{1-6} hydrocarbyl group, or an amido having the formula $RC(O)NR_2$-, where R is as defined above and R_2 is a C_{2-6} alkyl; R' is a C_{2-12} alkyl; x is 0-5; n is the number of moles of monovalent anion A to provide a net zero charge; and A is a monovalent anion; and

(ii) 50-99 weight % of a cationic fabric softener agent, said agent being selected from the group consisting of ester-containing quaternary ammonium compounds, amido amine quaternary ammonium compounds, imidazoline quats and mixtures and salts thereof.

2. The rinse cycle fabric softener concentrate of Claim 1 wherein said blend comprises from about 2 to about 20 weight % of said polyquat and from about 80 to about 98 weight % of said cationic fabric softener agent.

3. The rinse cycle fabric softener concentrate of Claim 2 wherein said blend comprises from 5 to about 15 weight % of said polyquat and from about 85 to about 95 weight % of said cationic fabric softener agent.

4. The rinse cycle fabric softener concentrate of Claim 1 wherein said polyquat is a compound wherein R is said C_{10-24} alkyl.

5. The rinse cycle fabric softener concentrate of Claim 4 wherein said polyquat is a compound wherein R is a C_{16-18} alkyl.

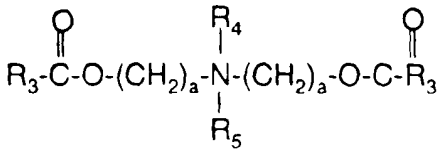
6. The rinse cycle fabric softener concentrate of Claim 5 wherein said polyquat is tallow diquat or tallow triquat.

7. The rinse cycle fabric softener concentrate of Claim 1 wherein said polyquat is a compound wherein R is said ether moiety.

8. The rinse cycle fabric softener concentrate of Claim 1 wherein said polyquat is a compound wherein R is said amido moiety.

9. The rinse cycle fabric softener concentrate of Claim 1 wherein said cationic fabric softener agent is an ester-containing quaternary ammonium compound or salt thereof.

10. The rinse cycle fabric softener concentrate of Claim 9 wherein said ester-containing quaternary ammonium compound is a compound having the formula:

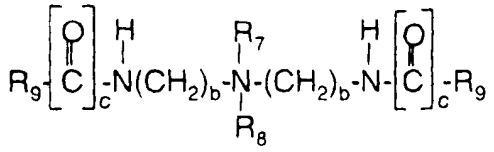


wherein each R_3 is the same or different and is a C_{9-23} alkyl, R_4 and R_5 are the same or different and are hydrogen, C_{1-4} hydrocarbyl group or hydroxy alkyl; and a is from 1 to 6.

11. The rinse cycle fabric softener concentrate of Claim 10 wherein said ester-containing quaternary ammonium compound is TEA ester quat.

12. The rinse cycle fabric softener concentrate of Claim 1 wherein said cationic fabric softener agent is an amido amine quaternary ammonium compound or a salt thereof.

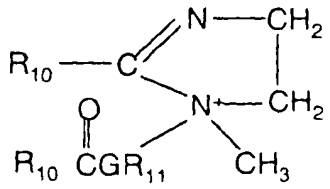
13. The rinse cycle fabric softener concentrate of Claim 12 wherein said amido amine quaternary ammonium compound is a compound having the formula:



wherein R_7 is hydrogen or a C_{1-4} alkyl, R_8 is a C_{1-4} alkyl, ethoxy or propoxy, each R_9 is the same or different and is a C_{7-22} alkyl or alkenyl group, c is 0 or 1, and b is 1 to 6.

14. The rinse cycle fabric softener concentrate of Claim 1 wherein said cationic fabric softener agent is an imidazoline quaternary ammonium compound or a salt thereof.

15. The rinse cycle fabric softener concentrate of Claim 14 wherein said imidazoline quaternary ammonium compound is a compound having the following formula:



wherein R_{10} is an acyclic alkyl or alkylene C_{11-21} hydrocarbon group; R_{11} is a divalent C_{1-6} alkyl group; G is O or NH and A is a monovalent anion.

16. The rinse cycle fabric softener concentrate of Claim 1 wherein said monoalkyl quat is tallow diquat and said cationic softening agent is TEA ester quat.

17. A rinse cycle fabric softener concentrate consisting essentially of a blend of (i) about 5 to about 15 weight % tallow diquat; and (ii) about 85 to about 95 weight % TEA ester quat.

18. A liquid rinse cycle fabric softener formulation comprising at least the rinse cycle fabric softener concentrate of Claim 1.

19. The liquid rinse cycle fabric softener formulation of Claim 18 further comprising a liquid carrier.

20. The liquid rinse cycle fabric softener formulation of Claim 19 wherein said liquid carrier is water; a C_{1-4} monohydric alcohol; a C_{2-10} polyhydric glycol, diol or triol; a polyalkenylene glycol; or combinations and mixtures thereof.

21. The liquid rinse cycle fabric softener formulation of Claim 19 wherein said rinse cycle fabric softener concentrate is present in an amount of from about 2 to about 40 weight %.

22. The liquid rinse cycle fabric softener formulation of Claim 18 wherein said polyquat is tallow diquat and said cationic fabric softening agent is TEA ester quat.

23. The liquid rinse cycle fabric softener formulation of Claim 22 wherein said tallow diquat is present in said concentrate in an amount of from about 5 to about 15 weight % and said TEA ester quat is present in an amount of from about 85 to about 95 weight %.

24. A method of laundering fabrics comprising the steps of

(a) washing a fabric in water in the presence of a detergent, and

(b) rinsing the washed fabric of step (a) in the presence of at least the rinse cycle fabric softener concentrate of Claim 1, said rinse cycle fabric softener concentrate is effective in providing improved softness and dye inhibition to said fabric.

25. The method of Claim 24 wherein said detergent is comprised of at least one anionic surfactant.

26. The method of Claim 24 wherein said formulation consists essentially of a blend of tallow diquat and TEA ester quat.

27. The method of Claim 26 wherein said tallow diquat is present in said formulation in an amount of from about 5 to about 15 weight % and said TEA ester quat is present in an amount of from about 85 to about 95 weight %.